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Use of Omentum Pedicled Graft to Protect Great Vessels in Gastric Transposition for Pharyngoesophageal Cancer

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Background and Objectives: Transmediastinal gastric transposition and pharyngogastric anastomosis is perhaps one of the most widely accepted methods for restoration of the alimentary continuity after pharyngoesophageal resection. The need of neck dissection, mediastinal tracheostomy, and previous radiotherapy may favor exposure and rupture of major vessels. Protection with omentum may prevent this complication. A comprehensive review of omentum flap use in surgery was undertaken.

Methods: A modified omentum pedicled flap was used in 6 out of 36 patients submitted to total pharyngolaryngoesophagectomy and gastric transposition (PLE&GT).

Results: None of the patients had major vessel rupture as compared with a 13% carotid and innominate artery rupture of a series of 30 patients previously operated on without omentum pedicled flap protection.

Conclusions: The omental pedicled flap, performed as described, may provide reliable protection for carotid and innominate artery exposure, adding little time to the procedure.

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KEY WORDS: **carotid and innominate artery protection; omentum protection; hypopharynx; esophagus; carcinoma; surgery; pharyngolaryngoesophagectomy**

INTRODUCTION

Many methods of repair of circumferential pharyngoesophageal defects for cancer have been devised since the beginning of this century, mostly categorized into two general types: those using skin flaps and those using transposed visceral organs, with or without microvascular anastomosis. Transmediastinal gastric transposition and pharyngogastric anastomosis is perhaps one of the most widely accepted methods for restoration of the alimentary continuity after pharyngoesophageal resection.

Very often there is a need for unilateral or bilateral neck dissection along with total pharyngolaryngoesophagectomy and gastric transposition (PLE&GT) [1–4]. Not infrequently, these tumors also require manubrial resection and mediastinal tracheostomy [1–7]. When neck dissections are associated with PLE&GT, carotid and innominate arteries are at higher risk of rupture, especially if the patients have had previous radiotherapy [2,3,6]. This risk can be as high as 20.3% [3].

In the last few decades, several methods have been used to protect carotid or innominate arteries. These methods include regional trapezius muscles [7], levator scapula muscle [8], pectoralis major muscle [9], regional

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skin flaps [10], deltopectoral flap [11], and even free fascia grafts [12] or dermis graft [13]. From the above mentioned methods of vessel protection, only the pectoralis major muscle flap (or the latissumus dorsi flap) provide enough tissue area to protect both carotid and innominate arteries in PLE&GT. The need of tissue coverage is also increased with manubrectomy and mediastinal tracheostomy. Thus, a good alternative in PLE&GT is the use of a pedicled omentum graft to protect both carotid and innominate arteries, with the additional advantage of reinforcing the pharyngogastric anastomosis.

Coverage of the carotid or innominate arteries with the greater omentum in head and neck surgery has been reported previously [14,15]. Freeman et al. [15], already listed the advantages of the greater omentum in vessel protection, the most prominent being the fact that it is readily available in the surgical field, it has an excellent vascularization, and it can be transported to the neck along with the stomach. In cervical exenteration, the omental pedicle flap is indispensable to protect the major vessels. In the last few years, the use of the omental pedicled flap head and neck surgery has not been reported frequently. We have modified the technique of omental transposition in performing a PLE&GT.

MATERIALS AND METHODS

Patients

In our series of 36 consecutive patients submitted to PLE&GT we have used a modified omental pedicled flap to cover the great vessels (carotid and innominate arteries) in the last six patients. Two patients had postcaricoid carcinomas, two had combined laryngeal and esophageal carcinomas, one had pyriform sinus carcinoma, and one had a cervical esophageal carcinoma. Five patients had previous radiotherapy to the region. Only one of the six patients had combined breast plate resection. In this patient, the omental pedicled flap was combined with a pectoralis major myocutaneous flap. The other five patients had definitive tracheostomies below the sternal notch, even though the manubrium was not resected. All had neck and upper mediastinal node dissection.

Technique

The total PLE&GT is undertaken in the usual fashion, described previously by several authors [1–5,16,17]. In performing the mobilization of the stomach, it is of utmost importance that the right gastroepiploic arcade be identified and protected. In the usual fashion, the mobilization of the stomach is continued along the greater curvature up to the gastric fundus, by dividing and ligating the vessels between clamp sequentially, remaining at least 2 cm away from the greater curvature of the stomach. The greater omentum is left attached to the transverse colon and left undisturbed. In our technique, once the right gastroepiploic vessels are identified, the ligature along the greater curvature extends to a point reaching the gastric antrum. From this point on the omentum is preserved, leaving it attached to the greater curvature of the stomach, directing the ligatures toward the transverse colon. The omentum is then freed up from the colon in its avascular plane and the dissection and ligatures continued up to the gastric fundus, ligating the short gastric vessels from the spleen. The purpose is to maintain the vascularity to the omentum by the right gastroepiploic vessels. In this manner, it is possible to maintain at least a 15-cm base to vascularize the omentum pedicle flap (Figs. 1 and 2). The longitudinal amount of omentum to be delivered to the neck along with the stomach can then be tailored to the need of the coverage. Frequently, the omental tissue bulk delivered can be excessive, necessitating trimming the distal excess of tissue brought up. This can be done with the omentum already in the neck (Fig. 3). To prevent damage to the vascular arcade, it is also important that the mediastinal tunnel be large enough to pass both the stomach and the omentum. Likewise, it is important to prevent rotation of the stomach on its axis or kinking of the omentum during transposition. Figure 4 demonstrate CT with omental flap covering the neck vessels.

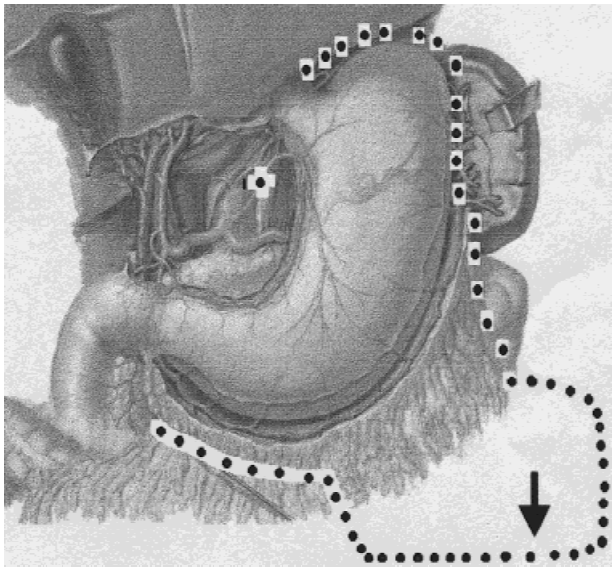

Fig. 1. Diagram of omentum preservation before gastric transposition.

RESULTS

The average duration of the procedure of PLE&GT was around 5.5 hr. Omental flap dissection added 10–15 min to the procedure. Average intraoperative blood loss was 800 ml. All six patients had unilateral or bilateral pleural drainage, these being the most frequent compli-

Fig. 2. Surgical aspect of laparotomy and gastric mobilization with attached omental pedicled flap.

Fig. 3. Surgical aspect of the pharyngogastric anastomosis and omental pedicled flap transferred to the neck showing pharynx (P), stomach (S), omentum (O), and tracheostomy tube (T).

cations. Other complications included superficial stomal edge necrosis, postoperative hypoparathyroidism (occurring in three patients), and wound infection in one patient (without fistula). Even though in our judgement these patients were at risk of major vessels rupture (extensive dissection, possible pressure of the stoma on the innominate artery, or previous radiotherapy to the region), none had carotid or innominate blow-out. In our previous 30 patients, the incidence of the carotid and innominate artery rupture was 3.3% and 10%, respectively. All six patients were able to take oral feedings between 10 to 12 days and discharged from the hospital on average at 16 days.

DISCUSSION

Total pharyngolaryngoesophagectomy and gastric transposition is a major procedure liable to many complications. One of the most important complications is rupture of carotid or innominate artery, frequently associated with increased morbidity or mortality (2 deaths in 4 ruptures in our early 30 patients). Previous radiotherapy and the addition of manubrial resection and mediastinal tracheostomy to the procedure of PLE&GT can augment this risk. Many of these rupture cases are usually associated with infection, pharyngocutaneous fistulas, or localized limited tracheal necrosis and can be minimized with pedicled omentum flap protection.

Review of the literature in the last few decades revealed that the pedicled or free omentum flap has been used by practically all specialties in surgery, transferred from the abdomen to as high as the scalp and brain and to as low as the perineum and lower extremities. In an experimental animal model, Moran et al. [18] concluded that the omentum provides immediate restoration of soft-tissue bulk and may also augment regional lymphatic drainage.

Surgeons have used the omental flaps to reconstruct face and scalp [19], chest wall after advanced breast

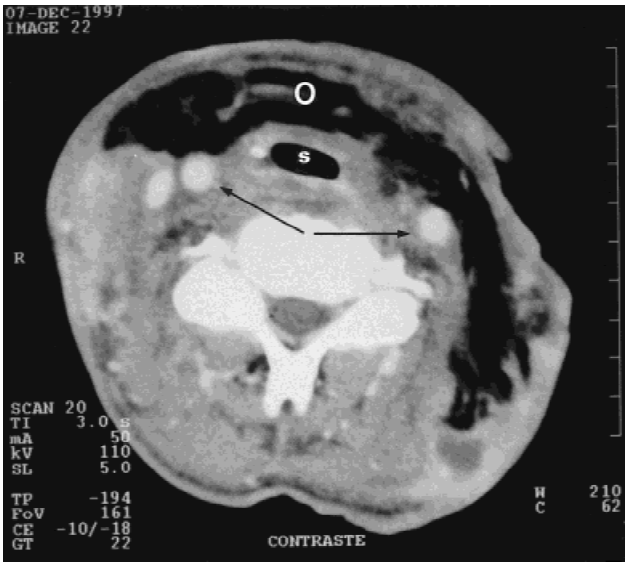

Fig. 4. CT of transferred omentum protecting carotid/innominate arteries showing omentum (O), carotid arteries (arrows), and stomach lumen (S).

surgery [20], soft-tissue thoracic and cardiothoracic problems [21–23], vascular surgery protection [24], colorectal surgery [25], major urological and gynecological surgery [26,27], and even in cerebral and spinal revascularization [28,29].

The use of the omentum pedicled flap specifically in PLE&GT has been reported only by Freeman et al. [15] and Grillo and Mathisen [30], with no other reports since 1990. Even though Grillo and Mathisen's study dealt primarily with colonic interposition, both publications mention use of the omental flap in prevention or correction of postoperative complications. Their technique apparently differs from ours in that the whole omentum was used.

In our experience with this technique, none of the patients had bleeding or fistulas. Therefore, the preventive effectiveness of the pedicled omental flap against potentially lethal complications was achieved. From the experience derived from our small series, we believe that the omental pedicled graft, performed as described, provides reliable vascularized tissue for protection of both the carotid and innominate arteries during total PLE&GT, adding very little time to the procedure. Additional advantages include tailoring the size of the flap to the defect and perhaps enhanced neovascularization protection to a possible ischemic trachea after extensive manipulation.

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